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COPPER-MATE PLUMBING MACHINE:
PRE-PRODUCTION DEVELOPMENT

Alberta
MUNICIPAL AFFAIRS
Innovative Housing Grants Program

[redacted]

COPPER-MATE PLUMBING MACHINE:
PRE-PRODUCTION DEVELOPMENT

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The views and conclusions expressed and the recommendations made in this report are entirely those of the authors and should not be construed as expressing the opinions of Alberta Municipal Affairs.

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FOREWORD

The project documented in this report received funding under the Innovative Housing Grants Program of Alberta Municipal Affairs. The Innovative Housing Grants Program is intended to encourage and assist housing research and development which will reduce housing costs, improve the quality and performance of dwelling units and subdivisions, or increase the long term viability and competitiveness of Alberta's housing industry.

The Program offers assistance to builders, developers, consulting firms, professionals, industry groups, building products manufacturers, municipal governments, educational institutions, non-profit groups and individuals. At this time, priority areas for investigation include building design, construction technology, energy conservation, site and subdivision design, site servicing technology, residential building product development or improvement and information technology.

As the type of project and level of resources vary from applicant to applicant, the resulting documents are also varied. Comments and suggestions on this report are welcome. Please send comments or requests for further information to:

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EXECUTIVE SUMMARY

OBJECTIVES

The general objective of this project was to complete the development of a machine for use in the plumbing industry which could cut, ream, and clean copper pipe and fittings, as well as cut plastic and aluminium pipe. To be effective, the plumbing machine would have to accomplish these tasks in a fashion less costly than traditional methods. This reduction in costs would occur as a result of labour savings realized through productivity improvements.

Under a previous project, The Copper-Mate I multifunctional plumbing machine was developed to meet this need for productivity improvement in the plumbing field, with financial assistance provided under the Innovative Housing Grants Program. The project was able to demonstrate that: 1) the machine generally performed cutting and cleaning operations well (within the limitations outlined in the final report); 2) plumbing costs were reduced through increased labour productivity; and 3) there was a possible market for the machine. The concerns about the first prototype machine related to: safety, especially with respect to cutting short pieces of pipe; the mechanical/electrical features which needed to be improved so the machine could pass CSA requirements; and machine portability which needed to be improved.

The detailed objectives of the project described in this report were to: address these concerns by refining the design; assess the new design through field testing; obtain CSA certification; and assess the market and prepare a production and marketing plan to commercialize the new Copper-Mate II.

METHODOLOGY

On the basis of experience with the Copper-Mate I prototype, detailed design criteria were developed to address such issues as:

- i) portability improvements and weight reductions;
- ii) performance and durability;
- iii) safety and certification requirements;
- iv) ergonomics; and
- v) costs.

The new prototype was designed and constructed based on these design criteria, as well as recommendations and comments from a recognized industrial designer and a senior engineer from the Canadian Standards Association. Further improvements were incorporated following testing on a construction project, and the machine was submitted to CSA for approval. The potential market was also analysed by examining statistics on the plumbing industry in Canada. Finally, production plans were developed.

MAIN FINDINGS

The quality of work obtained with the Copper-Mate II, when it was tested both in the shop and in the field, was equivalent to that undertaken with properly executed manual methods. The Copper-Mate II demonstrated its business value by providing labour savings of up to 85% in the cutting, reaming, and cleaning of copper pipe.

Although the tradesmen expressed initial resistance to the Copper-Mate II, once they became accustomed to its operating features they preferred the Copper-Mate II to the traditional manual methods. The Copper-Mate II was submitted and accepted for special CSA certification. While this does not allow for Canada

wide distribution, it does guarantee that the basic concept can at a later date be fully certified.

KEY ISSUES

A number of interviews with companies that operate in the mechanical contracting industry were conducted to determine their reaction to the Copper-Mate II. Although these industry representatives had little trouble recognizing the potential benefit associated with the Copper-Mate II, they placed its value at a level significantly lower than expected. Eliminating the differential in perceived versus actual value (as determined during in-house and field testing), remains the key issue affecting the level of success to be attained by the Copper-Mate II.

CONCLUSIONS

The project objectives of the Copper-Mate II were achieved, producing a plumbing machine capable of cutting, reaming, and cleaning copper pipe and fittings safely and with less labour input than traditional manual methods. Although the market feasibility study revealed less than enthusiastic results, the method of manufacturing utilizing subcontractors allows commercialization to proceed slowly on a demand basis.

1.0 INTRODUCTION

1.1 Background

Under a previous project supported under the Innovative Housing Grants Program, an initial version of a mutifunctional plumbing machine (referred to as the Copper-Mate I) was developed to meet the need for productivity improvement in the plumbing field. It is described in the report "Development of the Copper-Mate Plumbing Machine". More specifically, the previous project was undertaken to develop a labour saving machine capable of mechanizing the cutting, reaming, and cleaning of copper pipe and fittings. Although new products such as plastic pipe (drain and pressure) and compression type fittings have reduced the labour content in the mechanical contracting industry to an extent, the use of metal pipe, and in particular, copper pipe using labour intensive traditional solder methods is still extensive. The nature of the business is that the pipework must be fitted to the building structure as one of the last subsystems and as a result dictates expensive on-site labour. Given the relative importance and expense associated with field labour in the plumbing industry, any reduction obtained through increased labour productivity provides significant cost savings.

The project was able to demonstrate that:

1) the machine generally performed cutting and cleaning operations well;

2) plumbing costs were reduced through increased labour productivity; and

3) there was a possible market for the machine.

However, the project identified some concerns about the first prototype machine related to the following:

1) safety, especially with respect to cutting short pieces of pipe;

2) the mechanical/electrical features which needed to be improved so the machine could pass CSA requirements; and

3) machine portability which needed to be improved.

1.2 Project Objectives

The project described in this report was carried out to address these concerns and develop a production and marketing plan to bring the product to market. The new version of the machine, developed under this project, is referred to as Copper-Mate II.

The detailed objectives of this project were to:

1) refine the design of the Copper-Mate I multifunctional plumbing machine;

2) field test the machine to prove the new design features and confirm the cost savings;

3) obtain certification of the new machine by appropriate regulatory agencies;

4) produce a fully market-ready product; and

5) develop a marketing and production plan.

1.3 Review of Copper Pipe Cutting and Cleaning Practises

The most common tools for cutting copper pipe are the tube cutter and the hacksaw. (A tube cutter consists of an adjustable hardened steel wheel and two pressure rollers.

The cutting process involves clamping the cutter around the pipe and then revolving and subsequently tightening the cutting wheel as it cuts into the pipe.)

Inherent within both manual methods are a variety of problems. The hacksaw produces cuts that can be angled or formed with ragged edges. In either case, the fitting will not achieve full engagement. Disadvantages of the tube cutter are that it is relatively slow, especially on heavier pipe, and that a variety of cutters are required to cover the range of pipe diameters generally found on any particular job-site. In addition, a depression or burr can be formed on the inside of the pipe, especially on thin wall pipe, soft pipe, or when too much pressure is applied to the cutter in an attempt to complete the cut too quickly.

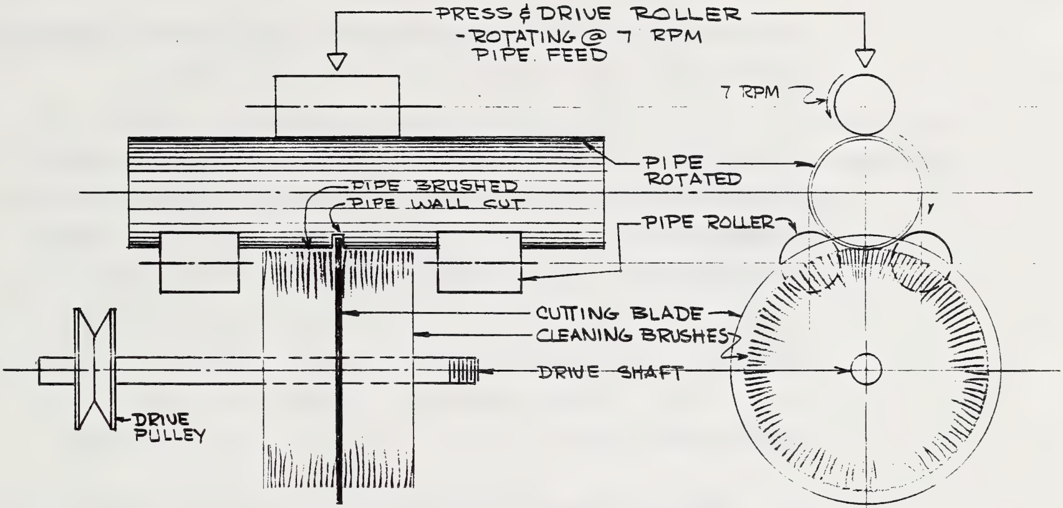
A wire wheel brush, sand paper, or steel wool is normally used to clean copper pipe and fittings. The cleaning process is required to remove an oxide film which forms naturally on copper pipe and can interfere with adhesion of the solder to the joints. While all three cleaning materials are generally capable of producing satisfactory results, problems can occur with steel wool and sandpaper as particles can be left imbedded in the relatively soft copper pipe. The recent banning of lead solder in domestic water systems has made proper cleaning even more critical, since the tin-antimony solders now used are particularly sensitive to unclean surfaces.

Consistent high quality work is important as mistakes are expensive and time consuming to repair. Generally, mistakes cannot be identified until the plumbing system is complete, filled with water, and pressure tested. The expense associated with repairing defects results from the plumber having to cut out the bad joint, drain the water from the lines, and finally to reassemble the pipe with a coupling.

While there are problems inherent in the traditional manual methods used in the cutting and cleaning of copper pipe, most are a function of careless workmanship and can be eliminated if enough time and effort are expended. The mechanized plumbing machine was developed to produce the quality results required without having to expend the level of effort required with traditional manual methods.

1.4 Copper-Mate I

The Copper-Mate I was a first generation machine capable of cutting and cleaning copper pipe and fittings. As shown in Fiqure 1, the Copper-Mate I consisted of a cutting blade with small radius brushes attached to each side of the blade on a shaft, powered by a 3/4 hp electric motor. A second electric motor (1/10 hp) powered the mechanized rollers which were used to rotate and hold the pipe in place. The mechanized rollers rotated the pipe at seven revolutions per minute. During the simultaneous cutting and cleaning stage, the cutting blade penetrated the pipe up to 6mm while the two brushes on each side of the blade engaged and cleaned the pipe wall.



SIDE VIEW CROSS SECTION

FIGURE 1: COPPER MATE I CUTTING & CLEANING MECHANISM

The Copper-Mate I did not have reaming capabilities, based on the assumption that a mechanized cutting blade would produce clean cuts not requiring the reaming process. Two smaller electric motors provided power to the brushes used in cleaning the oxide from the copper fittings. The cutting and cleaning functions of the Copper-Mate I prototype were mounted on a table constructed of 12-gauge (2.77 mm) steel.

Although the Copper-Mate I was capable of cutting and cleaning copper pipe, it was characterized by a number of shortfalls:

a) The rollers could not fully engage a short piece of pipe. This was required during the processing of a short length of pipe (5 to 15 cm) or when a small piece was being cut from a longer pipe. The short piece of pipe occasionally became wedged between the rollers and subsequently was projected through the air, creating a safety hazard to anyone operating or working near the Copper-Mate I.

b) The 3/4 hp electric motor lacked sufficient power to drive both the cutting blade and the two cleaning brushes. This was particularly the case when processing large diameter or thick walled pipe. A more powerful motor was not considered a viable option given the electric power capacity constraints on most construction sites as well as cost considerations.

c) The Copper-Mate I's large size and heavy weight reduced its portability. Its excessive weight resulted from the internal design features of the Copper-Mate I which necessitated the use of 12-gauge (2.77 mm) steel for the table.

The safety considerations associated with the Copper-Mate I eliminated the possibility of attaining CSA approval. Without CSA approval, it would not be possible to sell the Copper-Mate I in provinces outside Alberta. Design modifications were considered but ruled out since the problems originated in areas fundamental to the Copper-Mate I's operating procedure.

Based on the above observations, it was necessary to completely redesign the plumbing machine and start with a new and somewhat different concept. It was hoped that the design of the second generation plumbing tool, the Copper-Mate II, would solve the shortcomings of its predecessor.

2.0 DESIGN CRITERIA OF THE COPPER-MATE II

A number of factors had to be taken into consideration in designing the Copper-Mate II. While the basic objectives of the project remained consistent with the development of the Copper-Mate I, a number of refinements needed to be undertaken to prepare the product for introduction to the market.

2.1 Portability

The nature of the plumbing industry dictates that tools must be portable and easy to manoeuvre. A majority of the work is done on the jobsite over short durations, requiring significant transport of tools. Even with larger contracts, the tools have to be transported as the work progresses. It is essential that the Copper-Mate II be relatively light to allow for its transportation by one worker on any construction site. It was determined that the maxium weight of the Copper-Mate tool should not exceed 54 kilograms (120 pounds).

As the portability of the Copper-Mate II increases, so will its appeal to a greater number of markets. A large heavy tool lacking in portability would be limited to the shop environment or to only the largest construction sites. A highly portable plumbing tool could not only serve the large-project construction market, but could also serve the large number of small to medium sized construction projects.

2.2 Performance

The performance of the Copper-Mate II had to meet high quality standards and also reduce the amount of time and effort required to achieve those results. To become competitive in the market, the Copper-Mate II would have to process copper pipe and fittings at least to a level of quality equal to that of properly executed manual methods currently utilized.

In addition, the Copper-Mate II would have to perform the required functions with significantly less labour input. It was decided that the cutting, reaming, and cleaning of a 50 mm (2") diameter pipe had to be accomplished in less than thirty seconds.

2.3 Safety

The inability of Copper-Mate I to meet certain minimum safety considerations was a major shortcoming. A complete redesign of the plumbing machine was required to ensure that safety remained a priority. To be successful, the redesigned Copper-Mate II would have to eliminate all of the safety inadequacies inherent in the original prototype. To eliminate these concerns, the Copper-Mate II would have to be redesigned with special consideration given to either dramatically altering the roller mechanism or completely eliminating it.

2.4 Ergonomics

Ergonomic considerations include machine and operator interactions, ease of operation, and appearance. It is important to have the Copper-Mate II plumbing machine "tradesmen friendly". To achieve this, the proper height for the table had to be chosen to enhance the operator's ability to work comfortably. In addition, the amount of effort required to service the plumbing machine had to be kept to a minimum. While the aesthetic appearance of the Copper-Mate II will not affect its level of performance, it does play a significant role in the product's marketability.

2.5 Pricing Criteria

There are three basic components to the pricing criteria function. The first component relates the total cost of the inputs (including an appropriate profit margin) to the pricing strategy. The second component relates to the cost savings potentials achieved by the customers. This is primarily dependent on the type and volume of work being undertaken by the customer. The third component relates to the value of the Copper-Mate II as perceived by the customers. While this is linked to the second component, it is distinct because the true value to the customer and the customer's perceived value can differ to a large extent. All three components of the pricing criteria must be simultaneously taken into consideration in order for the Copper-Mate II to be successful in the market.

3.0 DESIGN DEVELOPMENT

3.1 General

At an early stage in the Copper-Mate II design it seemed important to separate the pipe and fittings preparations functions. It was assumed that by separating the functions into two machines and reducing the individual costs the total package would appear more affordable. It was also assumed that fittings could be cleaned separately from the pipe, perhaps by another crew.

Accordingly, a separate fitting cleaner tool was developed. It consisted of three fitting brushes driven by a sprocket and gear, all contained in a housing resembling a small briefcase with a handle. The power source was a purchaser supplied 3/8" or 1/2 " electric drill. The drill mounting was adaptable for most brands of drills.

Upon the completion of the prototype fitting cleaner at the cost of $1,050 it became apparent that the costs were prohibitive. It was also determined that the pipe and fitting preparations generally occur simultaneously as installations progress and could best be served when combined with each other.

Accordingly, this design concept was abandoned and the design proceeded as described in this section. As shown in Figures 2 and 3, the Copper-Mate II features a standard chop saw (Reference 1) fitted with a special blade designed for the cutting of non-ferrous metals.

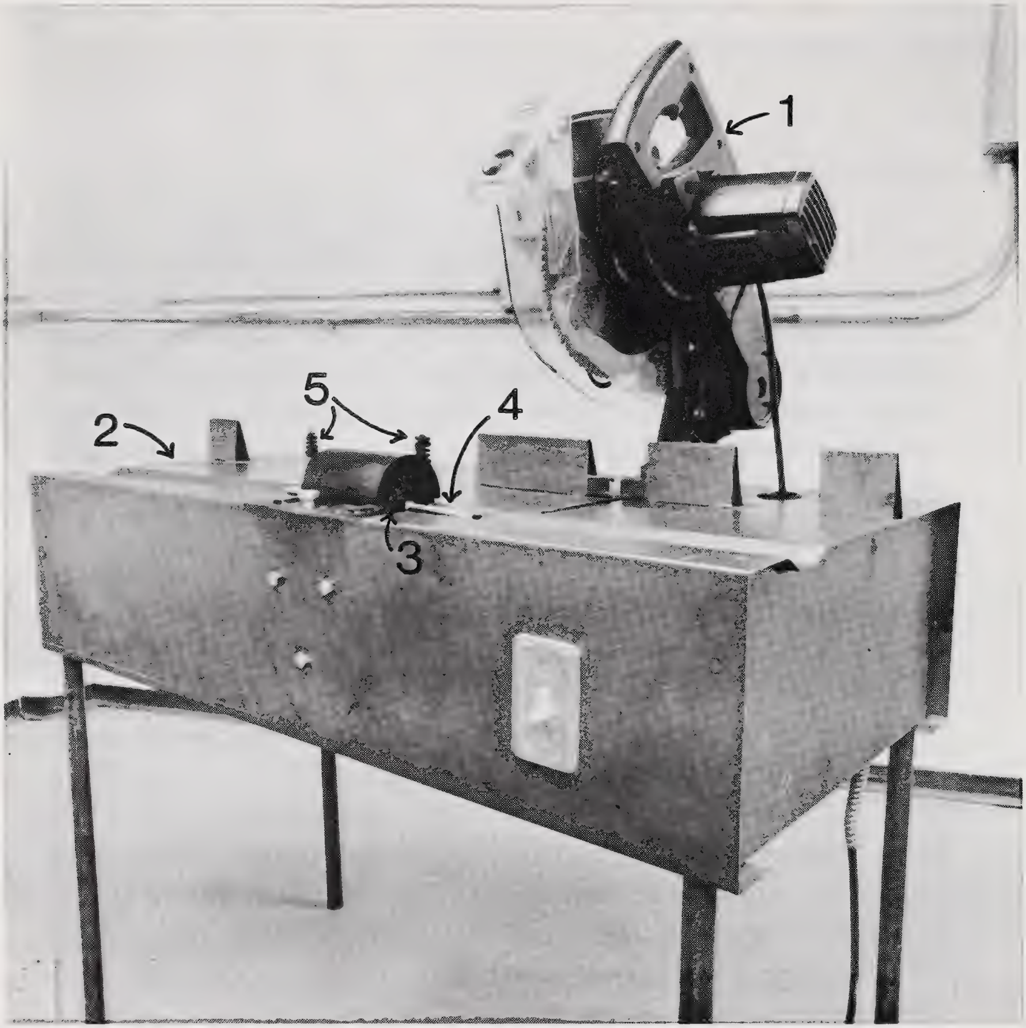


Figure 2: Copper-Mate II Components

References:

(1) chop saw

(2) table

(3) horizontal wire wheel brush

(4) reamer spindle

(5) vertical wire wheel brushes

The saw is mounted on a table (Reference 2) similar to the Copper-Mate I, although it is considerably lighter and easier to manoeuvre. Two separate operations are carried out on lengths of pipe. First, the pipe is cut with the chop saw, then the cut pieces are moved over to the brush and reamer, where the burrs on the outside of the pipe which are produced by the cutting process are cleaned by a horizontally mounted wire wheel brush (Reference 3). A rotating spindle (Reference 4) assists in removing the burrs, as well as reaming the inside of the pipe. The cutting and deburring procedures can be accomplished with significant savings in labour costs. In addition, the Copper-Mate II produces a level of quality which equals conventional methods but on a more consistent basis.

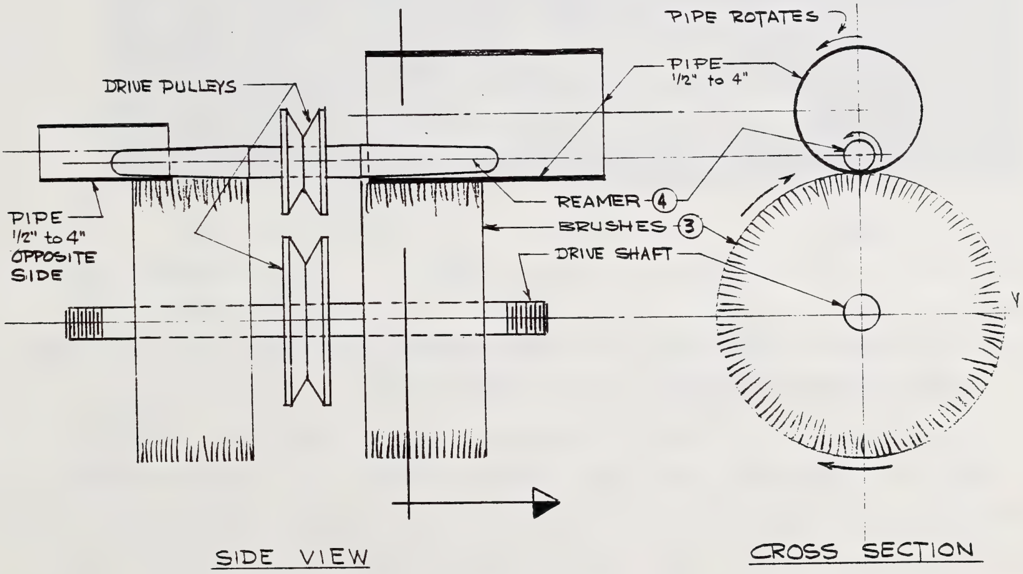


FIGURE 3: COPPER MATE II BRUSH & REAMER MECHANISM

The new design also includes several vertically mounted wire wheel brushes (Refence 5) of various sizes to mechanize the cleaning of the copper fittings. This function also produced savings in labour, although the savings are not as significant as with the cutting and cleaning of the pipe since a small amount of time is required in preparing copper fittings whether or not the conventional method or the Copper-Mate II is used.

3.2 Portability

In order to keep the Copper-Mate II as portable as possible, its weight was kept within the limits established in the design criteria. The distribution of the Copper-Mate II's weight is as follows:

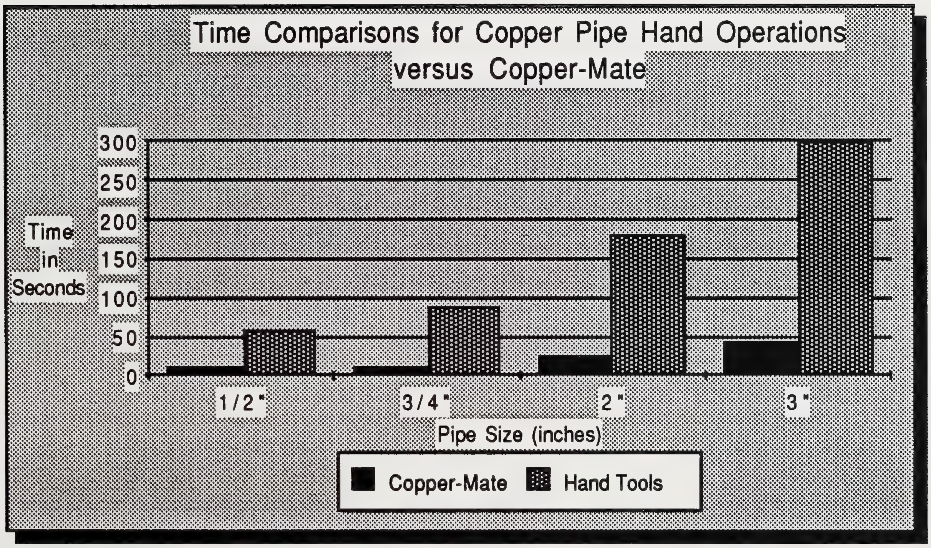
Electric Motor	13 kg	(28 lbs)
Chop Saw	9 kg	(20 lbs)
Fitting Cleaner Components	5 kg	(12 lbs)
Brushes and Reamer Components	6 kg	(13 lbs)
Housing Bench Enclosure	13 kg	(28 lbs)
Legs with Wheels	8 kg	(17 lbs)
TOTAL	54 kg	(118 lbs)

To further enhance the Copper-Mate II's portability, wheels were attached to two of the table legs.

3.3 Performance

To determine the level of operational performance, the Copper-Mate II was tested extensively under shop conditions by in-house personnel. The Copper-Mate performed exceptionally well under shop conditions.

Figure 4



The Copper-Mate II outperformed traditional hand tools for all different sizes of copper pipe. This was particularly true for the larger diameter pipe where the cutting, reaming, and cleaning of 3" pipe took approximately 5 minutes with hand tools compared to only 45 seconds with the Copper-Mate II. While the absolute largest savings in labour were experienced with the 3" pipe, the relative savings remained approximately the same with the Copper-Mate II taking only 15% of the time of traditional methods across all pipe sizes.

In addition to the in-house experiments, the Copper-Mate II was field tested for approximately three weeks. During this period, the tradesmen performed in excess of 1,000 operations to a point where the cutting blade required resharpening.

During the field testing, two problems became evident with the Copper-Mate II prototype. Although all functions of the cutting and cleaning procedure performed to expectations, the reaming function needed some fine tuning. The reaming rod tool which protrudes three inches into the pipe interior was slightly misaligned. This resulted in the tip making contact with the pipe and an inadequate reaming job being done on the edge where the pipe was cut. This problem can be remedied by simply having the reamer rod tool slightly tapered to allow for any minor misalignments as illustrated in Figure 5 below (exaggerated for emphasis).

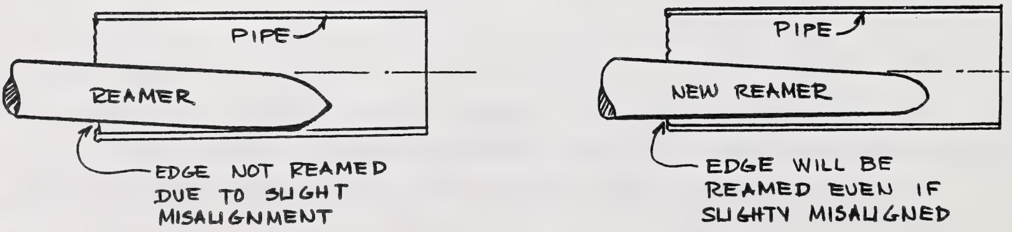

PIPE
REAMER
EDGE NOT REAMED DUE TO SLIGHT MISALIGNMENT
PIPE
NEW REAMER
EDGE WILL BE REAMED EVEN IF SLIGHTY MISALIGNED

Figure 5: Refining Reamer Design

To add the slight tapers would be an insignificant cost and would also allow easier pipe insertion into the reamer tool.

The second problem became evident during the cutting procedure. As pressure was applied to the chop saw when more than three quarters of the way into the pipe, the pipe would pinch the blade and slow it down. This problem occured because the metal table has a slit into which the blade recesses, which reduces the stiffness of the table surface around it. The addition of extra reinforcing on the underside of the table near the slit would solve this problem.

In addition to finding these two minor design problems, user comments on the operation of the Copper-Mate II also led to the development of a feature that would further enhance its usefulness. It was found that the tradesmen were employing an inexpensive beam clamp to serve as a pipe stop to aid in the cutting of a large number of pieces of pipe of the same length. This stop would be an attractive feature since many mechanical installations require repeat assemblies.

3.4 Safety

The redesign of the Copper-Mate I concentrated on the elimination of the roller mechanism from the cutting procedure. This resulted in the adaptation of a standard chop saw to be used in the cutting procedure, which overcame the major safety problem which had prevented Canadian Standards Association certification of the Copper-Mate I.

With this major modification complete, the Copper-Mate II was submitted for special CSA approval. This was a critical step in the development of the Copper-Mate II, as CSA approval was determined to be essential before production and marketing could begin.

Full certification was not requested at this time. Instead, special certification was chosen over full certification for two main reasons. Firstly, special certification cost approximately $300 compared to the full certification fee of $2,000. Secondly, full certification is based on the assumption that all subsequent machines would be of exactly the same design and composed of the same component parts. Any deviation would require a repeat inspection with an additional $2,000 fee.

Full certification is most appropriate for large production runs of identical items, while special certification is prefered for limited production of items which may be undergoing changes in design. For special certification, CSA must inspect each individual machine, although several machines may be inspected at once for the same total fee.

The Copper-Mate II machine was left on CSA's premises for a period of one week, while all facets of the machine's operation were assessed. Prior to granting special CSA approval, the CSA requested that a safety guard be placed on the underside of the Copper-Mate II table. This is to prevent anyone from being injured by the pulleys, belts, and brushes located inside the table.

3.5 Ergonomics

J. Tang & Associates Design Ltd. were employed to review and comment on the conceptual design and preproduction prototype with a view to improving the machine's ergonomics and aesthetics to increase its marketability. In general, the performance and ergonomics were considered to be good. A complete copy of the report as prepared by J. Tang &

Associates Design Ltd. is enclosed in Appendix A. The results of the review and the actions taken as a result are summarized below:

1. Ergonomics

   (a) Recommendation: An extendable table top.

   Response: The introduction of an extendable table top would compromise the simplicity of manufacturing, add more mechanics, add more weight, and increase the selling price. It was decided that the potential benefits would not justify the extra costs.

   (b) Recommendation: Handles and wheels.

   Response: This recommendation will be introduced into the production models.

   (c) Recommendation: An easily accessible servicing compartment.

   Response: Servicing and belt and brush replacement would be rarely required, perhaps once a month depending on usage. The addition of an access opening with an access door is not justified for this frequency of servicing. A large access opening would weaken the tub housing, and add to the cost of production. It is very easy to service the machine by tilting it on end.

   (d) Recommendation: A pipe gripper for the chop saw.

   Response: The chop saw enters the pipe from above against a firm backing, and the loose end of the pipe has no where to go. Approximately 1,000 cuts were performed in our shop and never was there a problem of flying pipe. Presently many chop saws are sold without the gripper and used in the same manner as in the Copper-Mate II function.

   The gripper could be easily added, at an additional cost. We believe the gripper would not be used and would only be an unwelcomed obstacle for the user.

(e) Recommendation: A push button emergency off switch.

Response: The push button emergency switch is a significant added cost and we believe a standard switch takes no less time to shut off.

The switch controls (1) a turning reamer rod shielded inside the pipe, (2) rotating soft wire brushes shielded under the table, and (3) three small fitting brushes on the table top. The above functions do not present significant hazards to the operator.

It was decided to stay with a standard switch.

(f) Recommendation: That the fitting cleaner brushes be rearranged in a triangle configuration.

Response: It was decided to maintain a linear fitting brush configuration but reduce the number of brushes from four to three. This would increase table top space and reduce costs by $85. The fourth brush was a luxury and not necessary, since changing a fitting brush takes only two minutes.

2. Aesthetics and Marketability

(a) Recommendation: That the chop saw not be included in the package.

Response: We agree that the chop saw should be deleted from the package thereby reducing the overall cost by 22%. The mounting would be designed to accept several readily available brands.

(b) Recommendation: Thicker legs.

Response: We fully agree with this recommendation and will incorporate it into the production models.

(c) Recommendation: Painting the Copper-Mate II machine.

Response: We fully agree with this recommendation and will incorporate it into the final production models.

(d) Recommendation: Utilize a sand cast aluminum structure.

Response: Although this would enhance the appearance and look professional, it would escalate the cost significantly and also add weight.

Instead, it was decided to use a particle board table top which would not only enhance the appearance, but would attenuate the noise, add rigidity, and reduce manufacturing costs. This is intended to be included in the production models.

It is also important to have the Copper-Mate II "tradesmen friendly". The table height was suitable as was the ease of replacing the sawblade and the cleaning brushes. While high noise levels were reduced compared to the Copper-Mate I, the major obtrusive noise is generated by the conventional chop saw and cannot be attenuated.

3.6 Pricing

The minimum selling price of the Copper-Mate II relates to the production costs. The following is a breakdown of estimated production costs (shown as percentages of the total since actual dollar values are considered proprietary information):

Suppliers	%
- chop saw	22
- 1/3 hp motor	9
- chucks	3
- brushes	4
- bearings	4
- misc.	4
Subtotal	46
Fabricators	
- machine shop	29
- metal shop	6
Subtotal	35
Other	
- painting	11
- packaging	2
- electrical	6
Subtotal	19
TOTAL ESTIMATED COST	100 %

With the addition of an appropriate profit margin to the manufacturing input costs, the selling price of the Copper-Mate II would be approxiamtely $1,250 including the chop saw. This represents a great improvement over the $2,500 price of the Copper-Mate I.

The second component of the pricing criteria relates to cost savings, as discussed in Section 2.5. Labour savings depend on the sizes and quantities of pipe being processed as well as other variables, but the following example illustrates the potential savings when using the machine:

To prepare only (cut,clean, and ream) a 2" pipe with a 2" 90° elbow takes forty seconds using the Copper-Mate II. To perform the identical preparations to the same standards using conventional methods takes four minutes and forty-five seconds. The difference represents approximately four minutes saved for each fitting connection.

On a typical plumbing installation, this operation is repeated fourteen times in an eight hour shift. This translates into appoximately a one hour saving or $18 per day. Based on this example, the Copper-Mate pays for itself approxiamtely every three man-months of work time, when only only one plumbing crew (eg. plumber and apprentice) is making use of the machine. If two crews were able to use the machine (either concurrently or on consecutive shifts), then the payback period could be as short as one and a half months.

The third component of pricing, the percieved value, is discussed under Market Research, Sections 5.2 and 5.8.

4.0 COMMERCIAL PRODUCTION OF THE COPPER MATE II

Because many of the production tasks will be subcontracted to fabrication shops, the proposed production procedure will require minimal in-house manpower, production space, and capital to begin production. The subcontracting strategy allows production to be geared to demand without carrying a large inventory of components or completed machines. Based on the above approach, and using contractors to perform most of the fabrication, it will be possible to assemble the components, package, and ship the machine with a minimum amount of in-house work.

The Copper-Mate II machine can be subdivided into several basic assemblies and components. These are summarized as follows:

1) Table structure with legs and wheels (manufactured locally)
2) Standard 10" chop saw (to be purchased)
3) Electric 1/3 hp motor (to be purchased)
4) Fitting cleaner assembly consisting of pulleys, bearings, chucks, and belting mounted in a channel housing with U-bolts
5) Pipe reamer/cleaner assembly.
6) Electrical wiring consisting of a simple switch and plug installation.

The proposed production procedure is as follows:

Table structure - A jig would be built so that all components are held in position and welded such that each table component maintains dimensional precision. Once each table has been assembled, it would be sand blasted, primed, and painted by another contractor. All electrical wiring would be completed leaving only one motor connection to be completed by the purchaser.

Chop Saw & Electric Motor - These items would be purchased and simply included with the other components in their prepackaged boxes, ready for bolting to the table by the purchaser. Alternatively, the chop saw may be supplied by the purchaser.

Fitting Cleaners and Pipe Reamer Cleaner Components - The pipe reamer/cleaner assembly remains the most difficult component to manufacture and will require some machining and welding. However, this component can easily be manufactured by any machine shop and would be simply bolted to the underside of the table. This component could be tendered out and mass produced.

Distribution would be done through established national wholesalers which generally have several branches in larger Canadian cities. Some of the plumbing and tool wholesalers have indicated a willingness to display the machine in their stores, for sale on a consignment basis.

5.0 MARKET RESEARCH

5.1 General

The analysis of the market was based on both secondary and primary information sources. Telephone conversations and interviews with potential customers were conducted to gather their reactions to the Copper-Mate II. Both qualitative and quantitative secondary information sources were used.

5.2 Customer Reaction

A series of interviews were conducted with representatives from a number of companies that operate in the mechanical contracting industry. The interviews were conducted with the Copper-Mate II available for inspection and demonstration. These interviews were used to obtain the reaction of individuals employed in the industry to the Copper-Mate II plumbing machine. Revenues of the companies interviewed ranged from $1-2 million range to over $30 million, with the average being approximately $17 million. The interviewees were generally responsible for making the purchase decisions for their respective companies.

The responses ranged from being quite reserved and unconvinced of the benefit associated with the product to being very enthusiastic. Nearly all of those interviewed believed that the Copper-Mate II could be successfully utilized in a shop environment for prefabrication purposes. Several of the respondents thought that the machine would be ideally suited to a company building a lot of apartments, high rises, or hospitals. When asked to place a dollar value on the Copper-Mate II, the responses varied from $500 to $1,500 with the average being slightly over $850.

The low percieved value of the machine is discouraging. However, we believe the demand for the Copper-Mate II will be greater than the survey results for the following reasons:

(1) Tradesmen do not subscribe to new innovations until they are forced into it by competition. The survey reflects a tradesman's current operating comfort and until a progressive company achieves a competitive advantage by using the machine, the Copper-Mate II will be unlikely to be in high demand.

(2) The survey covered a wide range of contractors, including smaller contractors which primarily do small projects and must frequently move from one small job to another. The Copper-Mate II machine is not intended for such applications. It is unfortunate that the large companies refused to take part in the survey even after persistent requests. For this reason, the survey may be placing too much weight on the responses from the smaller contractors.

(3) The survey reflects the fact that the Copper-Mate II machine was not a fully finished product, shown without paint, wheels, and other aesthetic refinements.

We believe that once this machine is used and demonstrates time savings, it will sell itself. From our shop experience, our tradesmen also showed reluctance to use the Copper-Mate II initially. However, after they became familiar with the machine functions, the machine was used continuously. Our senior superintendent, who was also hesitant at first, has since requested several machines for our projects.

5.3 The Industry

The mechanical contracting industry consists of firms engaged in the heating, air conditioning, and plumbing fields. Many of the smaller mechanical contracting firms specialize in one of these areas, while larger companies may offer services in all three areas. The plumbing field is a very labour intensive industry. Since pipework is one of the last subsystems installed in a building it is not conducive to prefabricated assemblies and as a result in most cases virtually all of the work must be conducted on-site.

The plumbing field has seen the introduction of materials into the industry intended to replace copper pipe. Plastic pipe, which includes both PVC (polyvinyl chloride) and ABS (acrylonitride-butadiene-styrene), has experienced large increases in useage in recent years due mainly to the decreased labour requirements for installation. Despite this, copper remains popular especially in commercial construction where regulations govern the use of plastic pipe.

5.4 Market Description

In 1986, there were just over 16,000 establishments in Canada classified as belonging to the mechanical contracting industry. These firms produced just under $7 billion in operating revenues. Within the mechanical contracting industry, a variety of trades operate. These trades have been classified by Statistics Canada in the following manner:

i) plumbing
ii) dry heating and gas piping
iii) wet heating and air conditioning
iv) sheet metal and other duct work
v) process piping
vi) automatic sprinkler systems
vii) commercial refrigeration
viii) environmental controls
ix) millwrighting and rigging
x) thermal insulation
xi) other trade work.

The Copper-Mate II could undoubtedly be used by a number of these trade applications. However, to maintain a conservative approach, only those firms classified as engaging primarily in the plumbing field have been considered as part of the potential market, as it is this sector of the mechanical contracting industry that will have the greatest need for the Copper-Mate II. These companies constituted approximately 55% (8,900 firms) of all the firms in the mechanical contracting industry. The total value of the construction output for this sector was approximately $2.5 billion in 1986.

5.5 Customer Characteristics

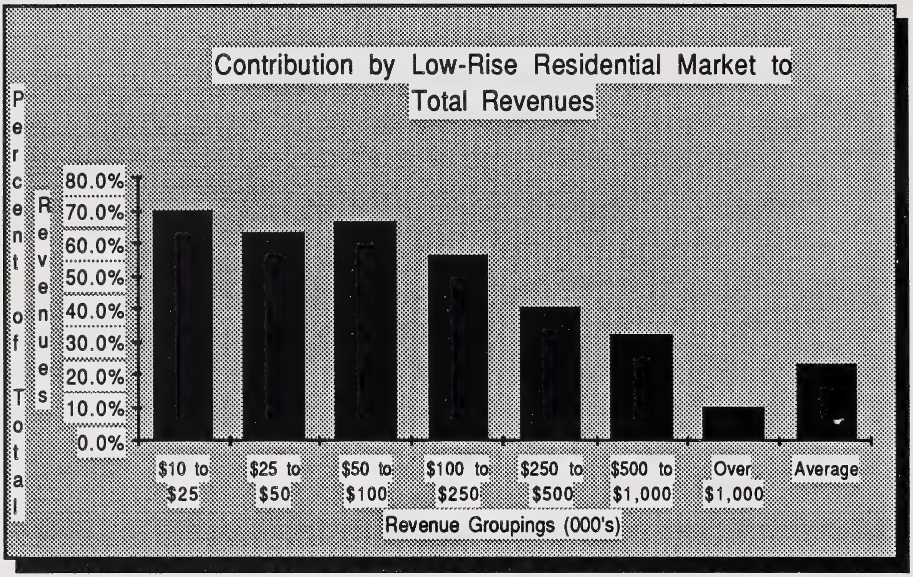
A series of telephone conversations and personal interviews were used to identify the characteristics of companies most likely to acquire the Copper-Mate II. One of the identified factors focussed on the type of construction usually undertaken by the company. It was generally agreed that the Copper-Mate II was not suited to low-rise residential construction activity (ie. single detached, duplex, and semi-detached dwellings). It was felt that the volume of work required on residential construction sites did not justify the handling costs associated with large machines such as the Copper-Mate II (ie. transporting the Copper-Mate to and from the job site, loading and unloading, moving the Copper-Mate around on the job site, etc.).

For similar reasons it was also felt that the Copper-Mate II was generally not well suited to the repair or renovation construction markets. It was also felt that the volume of work undertaken by the company would affect the Copper-Mate II purchase decision.

5.5.1 Residential Construction Market

On the basis of the interview conclusions outlined above, it was hypothesized that proportional contribution to total revenues from low-rise residential construction will have an inverse impact on the degree of attractiveness of the Copper-Mate II to a company: ie. companies that rely on the residential market for most of their revenues will not be very attracted to the Copper-Mate II. From information gathered by Statistics Canada on the mechanical contracting industry, a direct relationship between a company's size and its reliance on the residential market can be established (see Figure 6). The reliance on the residential market varies from a high of

Figure 6



just over 70% for companies earning between $10,000 and $25,000 per year to a low of approximately 10% for companies earning over $1 million per year. This suggests that the largest demand for the Copper-Mate II will come from the larger companies.

5.5.2 Repair Market

As with the residential market, it is hypothesized that a company's decision on whether or not to purchase the Copper-Mate II will be inversely related to its reliance on the repair market. The relationship between the company's size and its reliance on the repair market ranges from approximately 55% for those companies earning between $10,000 and $25,000 per year to 34% for those companies earning in excess of $1 million per year.

Figure 7

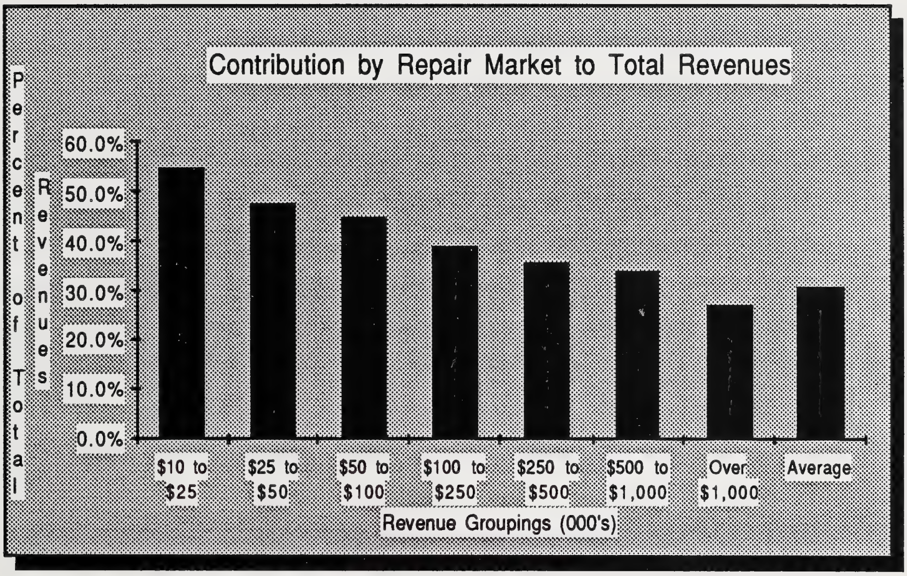


Figure 7 illustrates the inverse relationship between a company's revenue level and its reliance on the repair market over the complete spectrum of revenue groupings (the relative contributions of the residential and repair markets in figures 6 and 7 are not exclusive and as a result contain revenues that are common to both). This relationship also suggests that the largest demand for the Copper-Mate II will come from larger companies.

5.6 Competition

The closest competition to the Copper-Mate II in terms of a mechanized procedure is a machine marketed by Rigid. The capabilities of the two machine are not equally matched as the Rigid machine does not offer cutting capabilites. The

Rigid machine is priced at about $1,500 and has not been extensively adopted by the industry except on highly specific job sites (ie. hospitals) or in prefabrication circumstances.

Although there is no direct competition to the Copper-Mate II, the traditional method of cutting and cleaning copper pipe will present a significant barrier to entry. The industry uses inexpensive tools and is satisfied with the quality of work produced. In addition to being inexpensive, the tools are highly portable and can be carried up ladders or scaffolding.

5.7 Market Potential

Determining the market potential for the Copper-Mate II in Canada is difficult since information is not available in a manner which allows for strict identification of those firms which would obtain the greatest benefit from the Copper-Mate II. However, as suggested in the previous discussion, most demand will likely come from the larger companies.

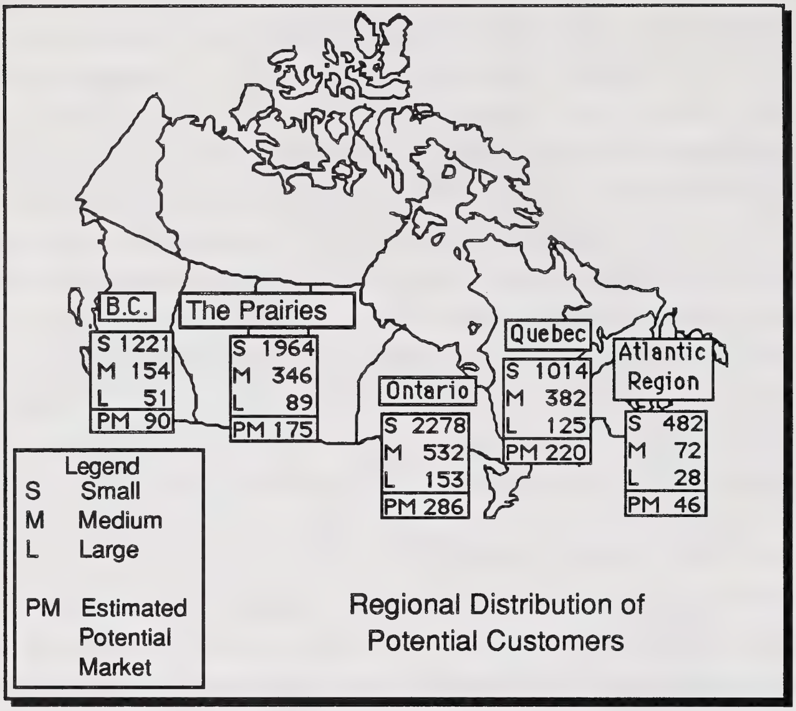
To maintain a conservative approach in estimating the market potential of the Copper-Mate II, small companies with revenues from $10,000 to $250,000 will be eliminated. All characteristics associated with this group indicate its incompatibility with the Copper-Mate II. Its low revenues produce insufficient volumes of work suitable for the Copper-Mate II. In addition, this group obtains a significant portion of its revenues from either the residential or repair market which is not relevant to its use.

It is difficult to evaluate the market potential of the group with revenues from $250,000 to $1 million. While the average revenue from these companies is significantly larger than the first group (~ $350,000 vs $65,000) and their reliance on the low-rise residential and repair markets is decreased (ie. from 60% to 37% for residential and from 42% to 35% for repair work), the characteristics implied from the absolute numbers do not necessarily reflect a compatible or an incompatible fit with the Copper-Mate II. Undoubtedly, the true level of compatibility lies at some point in between the two extremes. Keeping with the conservative approach, only 25% of the companies in this group will be included in estimating the potential market.

The final group contains all the companies earning in excess of $1 million in revenue per year. Since average revenues from this group are in excess of $2.1 million, since it has a relatively low dependence on the repair market (27%), and since the residential market makes such an insignificant impact on total revenues (10%), the entire group will be included in estimating the potential market.

On this basis, the total potential Canadian market for the Copper-Mate II is estimated at approximately 800 companies (ie. 25% of the medium and 100% of the large companies). The regional distribution of the entire plumbing sector of the mechanical contracting industry together with the projected potential market for the Copper-Mate II is presented in figure 8.

Figure 8



The largest potential market for the Copper-Mate II is located in Ontario with 286 perspective companies, followed by Quebec with 220, the Prairie provinces with 175, British Columbia with 90, and finally the Atlantic provinces with 46.

5.8 Factors Affecting Market Share and Sales

A number of factors will affect the market share obtained by the Copper-Mate II. The telephone and personal interview process established the pricing policy as one of the more critical factors affecting sales levels. Industry representatives had little trouble recognizing the potential benefit associated with the Copper-Mate II, but placed its value at a level significantly lower than expected. The general consensus placed the Copper-Mate II's value between $600 and $800. While the perceived value of the Copper-Mate II's value could probably be increased, it would require a strong sales and promotion campaign.

The launch and subsequent production of the Copper-Mate II faces a number of issues common to new venture launches with the greatest threat to the Copper-Mate II revolving around the balance between the price charged for the Copper-Mate II and the perceived benefit received from utilizing it. While the Copper-Mate II may well reduce labour times up to factor of six for the cutting and cleaning of copper pipe, a corresponding price cannot be charged unless potential customers fully perceive the extent of this benefit.

To increase the perceived benefit of the Copper-Mate II, a number of machines may have to be introduced at a reduced price (at or even below cost). An alternative stategy is to offer potential customers the option of leasing the product for a specific job for which it is well suited. One or both of these strategies will allow companies which are not sure of the Copper-Mate's capabilites to properly evaluate the benefit associated with using the Copper-Mate II without having to pay its full purchase price.

6.0 PROJECT CONCLUSIONS

Current practises for the cutting, reaming, and cleaning of copper pipe and fittings have remained unchanged for a considerable time. Since the plumbing function in construction is carried out almost entirely on-site, it consumes a significant amount of both time and labour. While the quality of work is generally good, there are a number of potential problems which are directly related to methods employed. While there are generally few mistakes, to identify and subsequently repair them involves an expensive process.

The Copper-Mate II plumbing machine uses approximately one sixth the amount of labour used with the manual methods. It achieves these savings by mechanizing the cutting, reaming, and cleaning functions. In addition, the Copper-Mate II produces work of equal quality to that obtained when traditional methods are properly applied but on a more consistent basis. The prototype is also easy and safe to use. The Copper-Mate II's simple operation enables workers to realize the full extent of its savings quickly.

Market research seems to indicate that while potential customers recognize the benefit associated with the Copper-Mate II, they may value it at a level significantly lower than the cost of production and the saving accruing for its use. Although part of this reaction may result from the limited number of large construction companies surveyed, it does indicate that market acceptance will be especially sensitive to the perceived value/price relationship.

As of November 1989, plans have been made to produce two Copper-Mate II machines. Some material sourcing has been carried out and minor redesign is taking place on the reamer component. Marketing will begin by renting the machines to contractors on larger projects with the intent of proving their worth. It is hoped that as on-site productivity is proven, other contractors will wish to purchase the Copper-Mate II.

Production will continue in a limited way depending on the demand. Manufacturing of Copper-Mate II lends itself to almost any production schedule because major capital investments are not required.

Appendix A - Report by Industrial Designer

J. TANG & ASSOCIATES
DESIGN Ltd.

March 23, 1989

Mr. Walter Romaniuk
Wil Mechanical Ltd.
4411 - 68 Avenue
Edmonton, Alberta

Re: Copper-Mate

Dear Mr. Romaniuk,

Further to our meeting on March 9, 1989, the following are the concept evaluation and design recommendations for the future development of the above referenced project:

CONCEPT EVALUATION

- The proposed product fullfils a common need for tradesmen when cutting and cleaning rims of different diameters (min. ½" to max. 4") of copper, plastic or aluminum tubing at work site.
- The idea of grouping a circular saw with 5 different steel wire brushes, which is operated by a built-in motor on a portable work bench, is sound. This enables a worker to carry out a cutting and rimming tubing operation with a high degree of efficiency.
- Since the proposed product is not highly technical, it can be maintained and serviced with ease.
- The manufacturing of the product does not require expensive tooling or assemblage equipment, and since it is aimed at a particular trade market, it is suitable to be produced by a small company.

RECOMMENDATIONS FOR FUTURE DEVELOPMENT

- Design of an extended table top can be utilized to decrease transportation and storage space, and increases the work surface.
- The arrangement of the three interior rimming brushes can be in triangular formation rather than linear to reduce surface area.
- Handles and wheels should be incorporated into the design for ease of maneuverability.

Suite 202, 10357-109 St.
Edmonton, Alberta
Canada, TJ5 1N3
Tel. (403)423-0434

RECOMMENDATIONS FOR FUTURE DEVELOPMENT (cont.)

- An easily accessible service compartment should be incorporated for future development. As it is now, the product must be turned upside-down or on its side for servicing and maintenance. Also, special tools are needed to make adjustments or change brushes, which should be eliminated.

- Sand casting aluminum structure together with fibre-glass or plastic-laminated wood casing can reduce the weight of the product and also act as a sound and vibration damper.

- For ease of manufacturing, some of the components should be simplified or eliminated altogether. ie: mounting bracket can be incorporated into main chassis.

- It is recommended that the circular saw not be included as part of the product package. The reason being that most tradesmen already own one or do not like the brand that is provided, which can affect the purchase decision. Therefore, the manufacturer can then eliminate the problems of warranty, inventory, mark-up and CSA approval. However, an adapter/s for the circular saw should be included in the package.

- A "pipe-gripper" should be designed in the future for safety reasons. With the present design, the operator must use one hand to hold down the pipe while the other hand operates the circular saw. After cutting, one end of the pipe is not secure which could prove hazardous.

- An emergency OFF (push) button should be incorporated in the design for safety measures.

- A design using thicker leg supports would attribute the product with a higher quality and sturdier appearance.

- Using colours such as blue or yellow for the main casing together with a dark grey and clear metal work top would give the product a clean, efficient and finer quality appearance.

Although it may not be realistic to incorporate all the aforementioned recommendations into the future development, however, they can act as a checklist and guideline for the design decision making process.

We thank you for the opportunity to be of service to you on this exciting product. We look forward to working with you on this in the near future.

Yours sincerely,
J. TANG & ASSOCIATES DESIGN LTD.

Joseph Tang
M. DES. RCA

Appendix B - CSA Certification Documentation

Canadian Standards Association

1707-94th Street, Edmonton, Alta T6N 1E6 (403) 450-2111, Fax: (403) 461-5322

March 31, 1989

Wil Mechanical Ltd.
Box 5633, Station L
Edmonton, Alberta
T6C 4G1

Attention: Walter Romaniuk

Subject: Certification of pipe cutter/reamer/cleaner

[illegible] LTD.
Job No.________
Job________
REC'D APR - 6 1989
Checked________
Paid________
Cheque No.________

Dear Sir:

The subject equipment would be classified as "Tools-Machine" which covers cord-connected grounded machine tools.

Requirements:

CSA Standard C22.2 No. 1-M1982 - General Requirements
Canadian Electric Code, Part II

CSA Standard C22.2 No. 4-M1982 - Bonding and Grounding of Electrical Equipment (Protective Grounding)

CSA Standard C22.2 No. 73-1953 - Electrically-equipped machine tools

The above standards may also require the use of associated Bulletins, Notices and/or supplements due for example, to new requirements becoming effective after publication of the standard.

The sample provided had the following concerns. Please note additional examination and testing may require other items to be addressed.

1. Supply cord shall be of a hard usage type suitable for an oil and wet location ~~(because of cutting fluids)~~
2. Component such as switches shall be suitably rated for the motor load involved.
3. The disassemble and reassemble of CSA certified cut-off saw shall provide the same degree of mechanical guarding as the original assemble.

....2

I have enclosed an application form that can be completed and returned when you wish to start the CSA certification process. For certification, we will also require the following:

1. One complete sample for testing and evaluation
2. Electrical schematic
3. Mechanical drawings
4. Parts list of electrical component showing manufacture, part no. and electrical ratings.
5. Model no. and electrical rating of overall device and description of any options that may be provided.

If you have any further questions, please feel free to contact us.

Yours truly,
CANADIAN STANDARDS ASSOCIATION

Gary Boswell
Senior Engineer

GB/gd

Canadian Standards Association

Western Regional Office
1707 - 94 Street
Edmonton, Alberta
Canada T6N 1E6

Phone: (403) 450-2111
Telefax: (403) 461-5322

SPECIAL INSPECTION REPORT

SA 1500 - 24590 - 1

COMPANY INVOICED
W.I Mechanical Ltd

REPORT BY: G. Boswell

DATE: 27 July 1989.

LOCATION OF EXAMINATION
W.I Mechanical Ltd
4411 68 Ave
Edmonton, Alta

Product (Type of Product) Pipe cutoff & preperation table

Manufacturer W.I Mechanical

Catalogue/Model No. CM 2

Connected (Cord/~~Permanently~~)

Dielectric Strength Test 1000 V (ac/dc) (Pass/Fail)

Flame Test ~~(Pass/Fail)~~ N/A

Risk Class ([✓ NA]/1/2/2G/3)

Max (Risk/Leakage) Current ________ (uA)

ELECTRICAL RATINGS

120 V

10 * A/W

60 Hz

1 Ph

Cut off saw 10 A
Polisher motor 10 A
Not run at same time.

Serial Number	**CSA Label Number**
0727 89	A225989

DECLARATION

The following technical requirements were used in the evaluation of the product covered in this report.

CSA Standard C22.2 No. ________

Caution Notices

ALTERATIONS: - Barrier provided to prevent access to pulley etc
- Nameplate complete electrical ratings

File/Dash SA1500-	Emp. #	Date (YYMMDD)	Hours	Km.	Other Costs	Purchase Order #
24590-1	2431	890727				

Product Inspected	Product Type	Model	Label Type	Labels Used Label # - Label #	Units	U/A	Test Area
Cutoff table		CM-2	997	A225989	1	A	

By signing below, you agree to all terms and conditions on both sides of this page.

Signed ________ Date July 27/89 LABELLED YES/NO

NOTE: EVALUATION MADE UNDER THE SPECIAL INSPECTION (PROVINCIAL & TERRITORIAL) SERVICE SHALL NOT BE CONSIDERED AS THE EQUIVALENT OF CSA CERTIFICATION

The name of the Association is protected by letters patent of incorporation and its certification marks "CSA" and "SP" are registered. CSA Marks and reports shall be used only in the manner and for the purposes authorized by CSA.

Canadian Standards Association

178 REXDALE BOULEVARD, REXDALE, ONTARIO, CANADA M9W 1R3

CABLE-CAN STAN LAB TELEX/TÉLEX 06-989344
TELEFAX TÉLÉFAX (416) 747-4149
ACCOUNTS RECEIVABLE COMPTE-CLIENT
TELEPHONE TÉLÉPHONE (416) 747-4025

Association canadienne de normalisation

AUTHORIZATION FOR SPECIAL ACCEPTANCE / INSPECTION WORK
AUTORISATION ACCEPTATION / INSPECTION SPÉCIALE

SUBMITTOR'S NAME AND ADDRESS/NOM ET ADRESSE DU REQUÉRANT

W.J Mechanical Ltd
4411 68 Ave
Edmonton, Alta.

BILLING ADDRESS (IF DIFFERENT FROM ABOVE)/ADRESSE DE FACTURATION (SI DIFFÉRENTE)

ATTN: Walter Romauk.

A 36155

FILE NO. / DOSSIER Nº SA 1500- Z4590 - 1

DATE 27 July 1989

BEFORE/AFTER EXAMINATION / AVANT/APRÈS EXAMEN

BY / PAR	DATE	HRS. / HEURES	

LAB TESTING / ESSAIS EN LABORATOIRE

BY / PAR	DATE	HRS. / HEURES	

EXAMINATION / EXAMEN

HRS. / HEURES	

TRAVEL / DÉPLACEMENTS

HRS. / HEURES	

OTHER COSTS / AUTRES FRAIS

ITEM / DESCRIPTION	
AIR FARE BILLETS D'AVION	
ACCOMMODATIONS HÔTEL	
CAR RENTAL LOCATION DE VOITURE	
PARKING STATIONNEMENT	
MISC. DIVERS	

* LABELS / * ÉTIQUETTES

QTY. / NOMBRE		SER. NO.S / Nos DE SÉRIE FROM / DE	TO / A
1		A225989	

FORM OF PAYMENT MODE DE PAIEMENT	INVOICE / FACTURE	CASH / COMPTANT	CHEQUE / CHÈQUE	PURCHASE ORDER NO. BON DE COMMANDE Nº

CSA REPRESENTATIVE SIGNATURE
SIGNATURE REPRÉSENTANT CSA

SUBMITTOR'S AUTHORIZED SIGNATURE
SIGNATURE AUTORISÉE REQUÉRANT

EQUIPMENT OWNER'S AUTHORIZED SIGNATURE
SIGNATURE AUTORISÉE PROP. DU MATÉRIEL

PRODUCT(S) APPROVED UNDER THIS SERVICE ARE NOT DEEMED TO BE CSA ACCEPTED UNTIL CHARGES ARE PAID.
LES PRODUITS APPROUVÉS EN VERTU DE CE SERVICE NE SONT PAS CONSIDÉRÉS ACCEPTÉS CSA AVANT ACQUITTEMENT DE LA FACTURE.

SUBMITTOR'S COPY / COPIE - REQUÉRANT

A ONE STOP GUIDE TO CERTIFICATION

Canadian
Standards
Association

CSA CERTIFICATION

Certification is a service offered by Canadian Standards Association to both the Canadian public and to the manufacturer marketing his product in Canada.

For the consumer, the CSA certification mark has become identified as a sign of safety, a device which increases the buyer's confidence in products. It has also, in many product lines, become a performance mark.

For the manufacturer, it is an assurance that all competing products meet an acceptable level established by nationally recognized concensus standards, upon which CSA certification is based.

Each application for certification is subject to the same policies and procedures and is treated the same.

The volume of applications is immense - some 1900 are received each month and it is in the manufacturer's interest and in Canadian Standards Association's that the process run as smoothly as possible.

To make this possible, CSA offers many certification options and places its technical and information resources at the disposal of its clients. Detailed information on all aspects of certification is available from the Certification Division.

This **ONE - STOP GUIDE TO CERTIFICATION** outlines some of these resources, phone numbers for key division personnel, and offers some basic advice on planning and smoothing the certification process.

THE ROLE OF CSA REGIONAL OFFICES AND AGENCIES

CSA has five regional offices located across the country and three Agencies overseas to provide information and assistance to certification clients.

In general, the regional offices can provide the following services:

1. Issue applications for certification.
2. Provide technical expertise and information on CSA programs which they offer.
3. Carry out regional inspections, and perform product testing in specific program fields.
4. Process single copy Visa or Mastercard or American Express cash and carry sales of CSA Standards.

The overseas Agencies can provide items 1, 2, and 3 of the above.

OFFICE LOCATIONS

HEAD OFFICE:
Canadian Standards Association
178 Rexdale Boulevard
REXDALE, Ontario, M9W 1R3
(416) 747-4000

REGIONAL OFFICES

ATLANTIC REGION:
Canadian Standards Association
43 Shediac Road
MONCTON, New Brunswick, E1A 2R6
Manager: Pat Paladino, (506) 855-5596

EASTERN REGION:
Canadian Standards Association
865 Ellingham Street
POINTE CLAIRE, Quebec, H9R 5E8
Manager: Serge Comtois, (514) 694-8110

PACIFIC REGION:
Canadian Standards Association
5760 Minoru Boulevard
RICHMOND, British Columbia, V6X 2A9
Manager: Serge Bousquet, (604) 273-4581

REGIONAL OFFICES - Cont'd.

PRAIRIE REGION:
Canadian Standards Association
50 Paramount Road
WINNIPEG, Manitoba, R2X 2W3
Manager: Thomas Higgins, (204) 632-6633

WESTERN REGION:
Canadian Standards Association
1707 - 94 Street
EDMONTON, Alberta, T6N 1E6
Manager: Lloyd Morton, (403) 450-2111

PREPARING FOR CERTIFICATION

Preparing and planning are two essential steps in cost effective certification. They are key elements in reducing costs and the time it takes to get certification.

By some very basic planning, you can provide CSA with information which will minimize delays and allow the Association to provide timely and smooth certification of your products.

BEFORE APPLYING FOR CERTIFICATION

The following are some basic suggestions which you may wish to consider before making application for certification:

1. Assign one person as liaison in certification matters. This will allow that person to gain experience in standards and certification matters and provide continuity. Since CSA's engineers generally work in specialized fields, rarely moving from group to group, this will allow CSA staff and your staff to build up a good working relationship.

2. Test your products before applying for certification. Using CSA's facilities to eliminate problems can be costly and frustrating for both parties.

3. Know your standards. Applicable CSA Standards and Bulletins can be obtained through the Standards Sales Group at Head Office or through your Regional Office.

WHAT INFORMATION SHOULD BE SUPPLIED WITH A CERTIFICATION REQUEST

In order for CSA to serve you effectively, there is some basic information which should be supplied so that CSA can:

1. Provide application forms.
2. Prepare an accurate estimate of costs.
3. Determine what standards apply to your product.
4. Advise the sample(s) required.

INFORMATION REQUIRED

1. Name and address of:
   -Submittor - the organization wishing to obtain certification.
   -Factory - the location where the product will be produced.
   -Contact Person.

2. What the product is, and what it does. This need not be in great detail. It can be illustrated by catalogues or similar published information.

3. Complete electrical ratings (if applicable).

4. Relevant mechanical features.

5. Complete listing of models to be certified, the similarities or differences between them and previously certified models. A complete listing of components, certified and uncertified. Use of certified components avoids additional cost and delays.

6. Relevant test data, whether your own or from a test agency.

RETURNING YOUR APPLICATION AND CHEQUE TO CSA

Generally the Application Group will advise what information and material you should return to CSA with your application.

1. Do not send samples before this point in the program CSA may not need samples of all the models being certified.

2. Be sure to send Descriptive literature, advertising literature, photographs and technical drawings.

3. Be sure to send Specially requested test samples, uncertified components, plastic plaques (where flame tests are required).

THE CERTIFICATION PROCESS

1. Your project will be assigned, and you will receive the name of the certification engineer who will act as your liaison on any questions regarding your product's certification.

2. After reviewing the application, the engineer will contact you to resolve any matters that need clarification.

3. The product will then be scheduled into the laboratory testing timetable.

4. After testing, the engineer will issue a "Findings Letter", documenting all changes which must be made for the product to meet the standard.

5. A Certification letter granting CSA certification will be issued when all technical questions have been resolved.

THE CERTIFICATION PROCESS - cont'd

6. The Agreements Group will forward a legal agreement covering the terms of certification for your signature.

7. A Certification Report will be published documenting and describing the product for inspection purposes.

REMEMBER

Don't hesitate to call if you have any questions. Try to reply promptly to queries from the certification engineer. Communication is the key. If the certification engineer is unavailable for any reason, his senior engineer or manager can help you. Delay may cause rescheduling of product testing which slows down the certification process.

The Findings Letter is of great importance. Areas where changes are required will be detailed, and you will be asked how the changes will be made. Certification cannot be granted until all technical queries are answered, so if there is anything you do not understand, ask for clarification.

INSPECTION, AUDITS AND INVESTIGATION

CSA certification is a multi-faceted process. It consists, not only of product or plant evaluation, but also a follow-up inspection system to ensure that the products reaching the marketplace are the same as the prototype sample tested. The right to conduct inspections forms part of the Certification agreement which you will sign. CSA Inspectors will make periodic unannounced visits to plants and may pick up samples for re-examination testing. The inspection is two pronged. The Audits and Investigations Group works in the marketplace, receiving feedback from regulatory authorities, fire personnel, consumers and retail stores, while Inspection Services works at the point of manufacture.

CERTIFICATION OPTIONS

CSA offers a wide selection of certification approaches to allow manufacturers to choose the certification option which is most effective for them.

Not all options are suitable for every type of operation. For information on those most suited to your needs contact:

WESTERN REGION OFFICE

(403) 450-2111

SOME OF THE OPTIONS AVAILABLE

MODEL BY MODEL CERTIFICATION

Perhaps the certification option with which most people are most familiar. Each model is tested to see if it meets all the requirements of applicable standards.

PRODUCT CERTIFICATION OF A LINE OF PRODUCTS

An adaptation of the model certification program. Representative samples of a line are carefully selected for testing. This method allows certification of a complete line at greatly reduced cost.

CUSTOM BUILT EQUIPMENT

Recognizing the special needs of custom equipment manufacturers, CSA has established a flexible program which allows manufacturers to obtain certification, while continuing to produce products which may never be identical. This option is available only for specific product groups.

EXTREMELY LARGE EQUIPMENT

Obviously it is physically impossible for extremely large products to be sent to CSA for testing. By special arrangement with manufacturers CSA will examine and test products in the manufacturer's plant.

COMBINED ENGINEERING / INSPECTION

The certification process at CSA consists of two phases - product, plant or service evaluation, and follow-up inspections. In the case of highly engineered products such as home entertainment equipment, follow-up inspections are carried out by the product engineers.

CATEGORY CERTIFICATION

To meet the needs of high technology manufacturers with many variations in product design, CSA offers broad category certification. CSA engineers visit plants as frequently as necessary to ensure good program control and discuss changes, while allowing manufacturers to move rapidly with inovations.

CERTIFICATION BY FIELD TESTING

CSA's child resistant packaging certification program is a good example of this type of program. A cross-section of consumers of various ages, from children to seniors, test samples by attempting to open containers by hand.

PLANT CERTIFICATION

CSA offers plant certification in specialized areas such as concrete testing laboratories and repair shops for electrical equipment intended for use in hazardous locations.

FOR INFORMATION ON THESE AND OTHER PROGRAMS

CONTACT YOUR REGION OFFICE

(403) 450-2111

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